

HEATER FOR HEATING THE DISHWASHING LIQUID IN A DISHWASHER

5 Cross-Reference to Related Application:

This application is a continuation of copending International Application No. PCT/EP99/09610, filed December 7, 1999, which designated the United States.

10 Background of the Invention:

Field of the Invention:

15 The invention lies in the field of appliances. The invention relates to a heater for heating the dishwashing liquid in a dishwasher with a pump that is connected for liquid-channeling action to a dishwashing compartment, is disposed outside the dishwashing compartment and, essentially, includes a motor and an impeller disposed in a pump housing.

20 Dishwashers are operated by dishwashing programs in which a pump circulates heated dishwashing liquid. The dishwashing liquid acts by corresponding devices, usually by spray devices such as rotating spray arms, on items that are disposed in a treatment space - a dishwashing compartment - and are to be cleaned.

To heat the dishwashing liquid, heaters are disposed in dishwashers, these heaters, as is the case, for example, in German Published, Non-Prosecuted Patent Application DE 35 28 696 A1, being disposed on the base of the dishwashing compartment. Configuring heaters on the base of the dishwashing compartment results in a reduction in the space into which items that are to be cleaned can be introduced and increases the formation of limescale on the heaters due to the evaporation of the dishwashing liquid as the heaters are repeatedly dried to the full extent. To avoid the disadvantages, the heaters, as is described, for example, in German Published, Non-Prosecuted Patent Application DE 36 26 955 A1, are also disposed in a flow heater that may be disposed outside the dishwashing compartment. Such a configuration requires additional outlay in terms of liquid-channeling lines and reduces the space in which subassemblies required in a dishwasher can be disposed. U.S. Patent No. 3,576,378 to Hilmanowski describes allowing the motor of the pump to project into the dishwashing container, for the purpose of saving energy, to utilize the operational heat of the motor in addition to the heaters for the purpose of heating the dishwashing liquid. Also described, for example, in German Published, Non-Prosecuted Patent Application DE 29 38 883 A1, is a configuration where the heaters are disposed around the motor of the pump. The motor projects into the dishwashing compartment, to ensure sufficient heating of the

dishwashing liquid. In the configuration, the number of line through-passages through the dishwashing compartment that require sealing is to be kept as small as possible. It has been found in practice that such a configuration may result in heating that adversely affects the motor. Moreover, of course, the disadvantageous formation of limescale on the heaters that has already been outlined above appears again. In addition, very high-outlay seals for electric cables that are to be led out of the motor into the dishwashing compartment are necessary.

#### Summary of the Invention:

It is accordingly an object of the invention to provide a heater for heating the dishwashing liquid in a dishwasher that overcomes the hereinafore-mentioned disadvantages of the heretofore-known devices of this general type and that provides an efficient heater, for heating the dishwashing liquid, that is disposed outside the dishwashing compartment without restricting the space for further subassemblies of the dishwasher and on the pump housing in heat-conducting contact with the interior of the pump housing.

With the foregoing and other objects in view, in a dishwasher having a dishwashing compartment and a pump fluidically connected to the dishwashing compartment for channeling liquid to the dishwashing compartment, the pump disposed outside the

dishwashing compartment and including a pump housing defining an interior and housing a motor and an impeller, there is provided, in accordance with the invention, a heater for heating dishwashing liquid having a heating device disposed on the pump housing in heat-conducting contact with the interior of the pump housing.

Due to the fact that the pump with motor and pump housing, as is predominantly customary at present, is disposed outside the dishwashing compartment, the loading space of the dishwashing compartment is not restricted because liquid-channeling lines that are already required are used. However, according to the invention, because the heating device and/or means are disposed on the pump housing of the pump that is already required, there is no need for any other subassembly in the space outside the dishwashing compartment. The configuration has the result that the space is not restricted in any way as far as other subassemblies are concerned. Because all the dishwashing liquid is circulated by the pump, i.e., is channeled repeatedly through the pump housing, sufficient heating of the dishwashing liquid is reliably ensured and an efficient heater is provided. The invention provides an efficient heater for heating the dishwashing liquid that is disposed outside the dishwashing compartment and that does not restrict the space for further subassemblies of the dishwasher.

To ensure better accessibility to the heater, e.g., for repair work, but also to ensure more straightforward installation and to avoid a reduction in the pump efficiency by disruption to the flow paths of the dishwashing liquid delivered by the pump, the heater, according to a preferred embodiment of the invention, is disposed on the outside of the pump housing.

In accordance with another feature of the invention, the heater is disposed on the outside of the pump housing on that side that is directed toward the motor. By virtue of such placement of the heater in the interspace between the motor and pump housing, there is no need for any additional protection of the heater.

In accordance with a further feature of the invention, the accessibility to the heater, e.g. for repair work, is further improved, but also installation is made more straightforward, in that the heater is disposed on the outside of the pump housing on that side that is directed away from the motor.

In accordance with an added feature of the invention, the heater is advantageously configured as an electrical resistance heater. Preferably, the heater is preferably configured as tubular heaters or alternatively as thick-film heaters.

Good heat transmission to the dishwashing liquid and durability are achieved, in accordance with an additional feature of the invention, in that, in the case of all the above-mentioned alternatives, that part of the pump housing that bears the heating means is produced from stainless high-grade steel.

In accordance with yet another feature of the invention, that part of the pump housing bearing the heater is provided with an enameled surface. In particular, thick-film heaters are used, which are usually applied as a pasty mass directly to the surface and, thus, require an insulating layer with respect to metallic carriers, the use, for example, of enameled metal sheets avoids the application of an additional insulating layer. Furthermore, it is also possible to use non-stainless materials for that part of the pump housing that bears the heater because the enameled surface ensures protection of the surface that comes into contact with the dishwashing liquid, which may possibly be provided with chemical additives.

In accordance with yet a further feature of the invention, there is provided a temperature switch. Alternatively, the temperature switch is a pressure switch or, preferably, a thermostatic switch. Such a temperature switch serves, on one

hand, for safeguarding the temperature of the heater and, on the other hand, for regulating the temperature of the dishwashing liquid and/or for controlling the operation of the heater.

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In accordance with yet an added feature of the invention, the thermostatic switch is expediently disposed on the pump housing.

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To ensure that the heat is not radiated into the surroundings and/or to the motor of the pump, in accordance with yet an additional feature of the invention, the heater is covered by an insulating layer, thus avoiding energy losses and damage to the motor.

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In particular, when heaters are disposed on the outside of the pump housing on that side that is directed away from the motor, the insulating layer is expediently covered by a protective plate.

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With the objects of the invention in view, there is also provided a dishwasher, including a housing defining a dishwashing compartment, a pump for channeling liquid to the dishwashing compartment, the pump fluidically connected to the dishwashing compartment, disposed outside the dishwashing compartment and inside the housing, and having a motor, an

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impeller, and a pump housing defining an interior and housing the motor and the impeller, and a heating device for heating dishwashing liquid, the heating device disposed on the pump housing in heat-conducting contact with the interior of the pump housing.

Other features that are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in a heater for heating the dishwashing liquid in a dishwasher, it is, nevertheless, not intended to be limited to the details shown because various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

#### Brief Description of the Drawings:

FIG. 1 is a cross-sectional view through a pump of a dishwasher with heaters disposed on the outside of the pump



housing on a side directed toward the motor, according to a preferred embodiment of the heater according to the invention;

Fig. 2 is a cross-sectional view through an alternative

embodiment of the pump of FIG. 1;

Fig. 3 is a cross-sectional view through a pump of the dishwasher with heaters disposed on an outside of the pump housing on a side directed away from the motor, according to a further advantageous embodiment of the heater according to the invention; and

Fig. 4 is a cross-sectional view through an alternative embodiment of the pump of FIG. 4.

#### Description of the Preferred Embodiments:

In all the figures of the drawing, sub-features and integral parts that correspond to one another bear the same reference symbol in each case.

Referring now to the figures of the drawings in detail and first, particularly to Fig. 1 thereof, there is shown a pump 1. Dishwashers are operated by dishwashing programs in which heated dishwashing liquid is circulated by a pump 1. The dishwashing liquid acts by corresponding devices, usually by spray devices (not explained in any more detail) such as

rotating spray arms, on non-illustrated items that are disposed in a treatment space - a dishwashing compartment 2 - and are to be cleaned.

5 In the case of the dishwashers that are shown in the exemplary embodiments, and are not described in any more detail, the pump 1 is disposed outside the dishwashing compartment 2, which is only partially illustrated. The pump 1 is connected for liquid-channeling action to the dishwashing compartment 2  
10 through an intake connection 3 in a manner that is not described in any more detail. All the exemplary embodiments shown also have in common the fact that the pump 1 essentially includes a motor 4 and an impeller 5. The impeller 5 is enclosed by a pump housing 6 made up of two parts - a pump-  
15 housing cover 7 and a pump-housing base 8. The pump-housing cover 7 and the pump-housing base 8 are connected to one another in a bayonet closure, which is not described in any more detail, with the interposition of a seal 11, and to the housing of the motor 4. The motor housing is not explained in  
20 any more detail. The flow direction of the dishwashing liquid is indicated by an arrow 9.

According to the invention, heating means or heaters 10, 10' are disposed on the pump housing 6 in heat-conducting contact  
25 with the interior of the pump housing 6, i.e., with the dishwashing liquid channeled through the interior of the pump

housing 6. All the exemplary embodiments shown also have in common the fact that the heaters 10, 10' are disposed on the outside of the pump housing 6, and that all the heaters 10, 10' shown are configured as an electrical resistance heater.

5 Tubular heaters are designated 10 and thick-film heaters are designated 10'. The heaters 10, 10' are covered by an insulating layer 12, which is indicated by dotted lines in the figures. To safeguard the temperature of the heaters 10, 10' and to regulate the temperature of the dishwashing liquid and/or to control the operation of the heaters 10, 10', a temperature switch 13, in the exemplary embodiments, a thermostatic switch, is disposed on the pump housing 6. Alternatively, it is also possible to use a pressure switch.

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FIGS. 1 and 2 show embodiments of the invention in which the heaters 10, 10' are disposed on the outside of the pump housing 6 on a side that is directed toward the motor 4 - on the pump-housing base 8. In the exemplary embodiments shown, the pump-housing base 8 bearing the heaters 10, 10' is produced from stainless high-grade steel. Alternatively, that part of the pump housing bearing the heaters may be provided with an enameled surface, which, in particular if use is made of thick-film heaters, makes it possible to dispense with an additional insulating layer. Also, if use is made of tubular heaters, it is additionally possible to use non-stainless

materials for that part of the pump housing that bears the heaters.

FIG. 1 shows a preferred embodiment of the invention in which the heaters 10 are tubular heaters 10 soldered helically on the pump-housing base 8.

Fig. 2 shows an advantageous embodiment of the invention in which the heaters 10' are thick-film heaters 10' applied helically to the pump-housing base 8. A fuse 14 may be disposed upstream of the thick-film heater 10' as shown.

FIGS. 3 and 4 show embodiments of the invention in which the heaters 10, 10' are disposed on the outside of the pump housing 6 on a side that is directed away from the motor 4 - on the pump-housing cover 7. The pump-housing cover 7 bearing the heaters 10, 10' is produced from stainless high-grade steel. Alternatively, the part of the pump housing bearing the heaters may be provided with an enameled surface, which, in particular, if use is made of thick-film heaters, makes it possible to dispense with an additional insulating layer. Also, if use is made of tubular heaters, it is additionally possible to use non-stainless materials for that part of the pump housing bearing the heaters. A protective plate 15 covers the insulating layer 12.

FIG. 3 shows an advantageous embodiment of the invention, in which the heaters are tubular heaters 10 soldered helically on the pump-housing cover 7.

5 Fig. 4 shows another advantageous embodiment of the invention, in which the heaters 10' are as thick-film heaters 10' applied helically to the pump-housing cover 7. A fuse 14 may be disposed upstream of the thick-film heater 10' as shown.

10 Because the pump 1 with motor 4 and pump housing 6, as is predominantly customary at present, is disposed outside the dishwashing compartment 2, the loading space of the dishwashing compartment 2 is not restricted because use is made of the liquid-channeling lines that are already required  
5 to supply the pump 1. However, because the heaters 10, 10' are disposed on the pump housing 6 of the pump 1 that is already required, there is no need for any other subassembly in the space outside the dishwashing compartment 2. The configuration has the result that the space is not restricted  
20 in any way as far as other subassemblies are concerned. Because all the dishwashing liquid is circulated by the pump 1, i.e. is channeled repeatedly through the pump housing 6, sufficient heating of the dishwashing liquid is reliably ensured and an efficient heater is provided for heating the  
25 dishwashing liquid, and which is disposed outside the

dishwashing compartment 2 without restricting the space for other subassemblies of the dishwasher.

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